



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

For: METHOD AND APPARATUS FOR CHARACTERIZING AND ESTIMATING THE PARAMETERS OF HISTOLOGICAL AND PHYSIOLOGICAL BIOMETRIC MARKERS FOR AUTHENTICATION

Art Unit
(not assigned)

Assistant Commissioner for Patents
Washington D.C. 20231

Transmitted herewith for filing is a Petition to Make Special (40 pages); Form PTO-1449 (2 pages); Copies of 32 references; Certificate of Deposit Under 37 C.F.R. § 1.8(1 page); Check No. 44469 for \$130.00; and Postcard.

The Commissioner is hereby authorized to charge payment of any fees associated with this communication or credit any overpayment to Deposit Account No. 50-0843.

Copies in duplicate of this sheet are enclosed.

DATED this 13 day of February, 2002.

Respectfully submitted,

Michael F. Krieger
Attorney for Applicant
Registration No. 35,232

KIRTON & McCONKIE
60 East South Temple, Suite 1800
Salt Lake City, Utah 84145
Telephone: (801) 328-3600
Facsimile: (801) 321-4893

Fabean. The search was conducted for United States patented art in Class 705, Subclass 5, Class 382, Subclasses 115, 116, 117, 118, 123, 124, 125, 126, and 127, and Class 235, Subclasses 375, 376, 379, 380, 381, 382, 383, 384, 385, and 386. The search was further conducted in G06F 15/00 and 15/02, G06K 9/00, G06T t/00, and H04B 5/00. A copy of each potentially relevant reference discovered in this search is provided for your review.

The following references were discovered in the above-identified pre-examination search and will be discussed in greater detail below:

4,537,484	5,088,817	5,737,439	6,171,112	6,269,348
4,544,267	5,103,486	5,774,571	6,182,892	6,275,806
4,699,149	5,230,025	5,987,232	6,193,153	6,289,453
4,728,186	5,335,288	6,104,913	6,202,151	JP2000181871A
4,784,484	5,623,552	6,104,922	6,208,264	
5,073,950	5,666,400	6,148,094	6,225,890	
5,077,803	5,719,950	6,164,403	6,232,874	

A Form PTO-1449 citing the above-identified referenced patents has been included for the convenience of the Examiner.

Nature of the Present Invention

The present invention provides a method and apparatus for identification and authentication using physiological and histological biometric markers. The biometric markers of the present invention are substantially unique to each person, but not necessarily totally unique. In order to accomplish the present invention, it may be necessary to characterize and estimate the parameters of the physiological/histological markers. Characterization and estimation of the parameters of the physiological/histological marker will be referred to hereinafter as “individualization” of the physiological/histological markers. The biometric markers of the present invention are not merely

measurements of superficial anatomical structure or behavioral traits, but instead utilize or alternatively include measurements of physiological traits of the various systems of the human body and/or are histological traits associated with tissues of the human body, which are individualized to enhance the traits' capacity to function as a biometric marker.

The present invention also contemplates the use of individualized biometric markers that may not be representative of any particular traits in and of themselves, but are a composite of various individualized physiological and/or histological traits. While the biometric markers of the present invention may be entirely unique to each person, markers that are not entirely unique but that are substantially unique may be used in the individualization and subsequent authentication process. This is made possible, in part, by the individualization system enclosed. In using substantially unique biometric markers, the present invention also allows a wide variety of biometric characteristics to be employed in a relatively compact and inexpensive device. The present invention employs an individualization method for use with biological markers that are substantially unique that remain relatively consistent from measurement to measurement and that preferably are capable of being measured without physically invasive procedures.

The present invention provides an efficient method for employing internal biometric markers. These internal markers can easily be used in conjunction with other biometric techniques to improve the layering technique. The layering technique can enhance the security capabilities of the present invention. Layering is a technique, which employs the use of more than one biometric marker for authentication. For example, the method of the present invention works to greatly simplify the measurement and authentication process, thereby making it more practical to employ layering techniques.

The use of physiological and histological markers allows the devices in which such a biometric system is used to be both secure and readily manufactured and marketable. The simplicity of these devices is due in great measure to the method of individualization that allows the measured waveform to be converted into a biometric marker. Because of the variety of ways in which the physiological markers can be measured and individualized using the present invention, a variety of measurements can be taken in the system, allowing for greater flexibility and variability in the markers used and design of the device. Contrary to the current trend in the biometric industry, the present invention does not limit the types of markers used for superficial anatomical structure or complex behavioral activity, and thus both simplifies and expands the potential applications for internal marks.

Other physical traits can be used for biometric authentication in conjunction with the individualization of a heartbeat. Where a biometric marker is measured using a signal that passes through these tissues, the tissues may have characteristics that affect the resulting signal or waveform characteristics that are substantially unique to each person. In a preferred embodiment of the present invention, a heartbeat waveform is measured using a signal that passes through dermal and subdermal tissues and their associated vasculature and musculature. Through these tissues the heartbeat of the user is measured and then individualized. The present invention provides for the use of specific histological traits of various human tissues, such as epithelial tissue, connective tissue, muscle tissue, and nervous tissue.

For example, the depth of the various layers of epithelial tissue from a given point on the skin surface may be a substantially unique histological trait that can be used as a biometric marker in conjunction with an individualized heartbeat. The density of a particular kind of connective tissue,

such as bone density, may be a substantially unique histological trait that can be employed in a biometric authentication system. Likewise, the light absorption characteristics of skin tissue could be a substantially unique histological trait.

In the same way that histological markers increase both the marketability and security of biometric systems, the physiologically based biometric markers of the present invention provide similar advantages. Specifically, when properly individualized, the heartbeat waveform provides physiological markers that do not require the scanning or mapping of anatomical structure. Neither do the heartbeat waveform markers require the analysis of volitional acts, as are required with voice or signature analysis. The heartbeat is a non-volitional, physiological process that occurs in the body. A physiological marker, such as a heartbeat waveform marker, could also include or be combined with other physiological processes. A heartbeat waveform marker could be associated with a physiological marker related to a different system, such as, the integumentary system, the skeletal system, the muscular system, the pulmonary system, the respiratory system, the circulatory system, the sensory system, the nervous system, the digestive system, the urinary system, the endocrine system, and/or the reproductive system. Included in the physiological biometric markers are those activities associated with the various physiological systems that occur automatically or, in other words, are non-volitional. All of these systems and related subsystems provide traits that can be measured in a variety of ways to provide additional substantially unique biometric markers for the present invention and may in some cases be individualized with the heartbeat markers.

Physiological and histological biometric markers, whether related to the heartbeat or not, may be measured in common units such as spacial measurements of length, area, and volume. Frequency is also another type of measurement that can be practically applied to histological and physiological

biometric markers. However, the present invention provides for the monitoring of these biometric markers in a variety of other additional ways. The relative motion of particles and fluids can be measured in terms of velocity, acceleration, volumetric flow rate or angular velocity, and angular acceleration. Physical interaction such as force, surface tension, pressure, viscosity, work, and torque are other possible measurements.

The physiological and histological markers may also be based upon energy or heat related characteristics such as power, heat quantity, heat flux, volumetric heat release, heat transfer coefficient, heat capacity, and thermal conductivity. Likewise, measurements, such as electric quantity, electromotive force, electric field strength, electric resistance, and electrical capacities, could provide biometric markers, depending upon the tissue or physiological process being monitored. Magnetic related characteristics, such as magnetic flux, induce, magnetic permeability, magnetic flux density, magnetic field strength, and magneto-motive force could be used. Other potential measurements may include luminous flux, luminance, illumination, radio nucleotide activity, radioactivity, temperature, and absorbed dose and dose equivalent, and amount of substance (mole).

In one preferred embodiment, an infrared light transmitter transmits an IR signal into a person's finger when the finger is placed on the transmitter. The signal transmitter is activated and a signal is emitted from the signal transmitter and is transmitted into the dermal and subdermal tissues of the person's finger. The signal is partly absorbed and reflected by the dermal and subdermal tissues. The reflected signal is received by a signal receiver and transmitted through receiving wires to a chip where the received signal or features of the signal are individualized. The signal may then be sufficiently unique to act as a biometric identifier or may be analyzed to provide

extracted features of the signal that can be used as a biometric marker such as a digital heartbeat waveform. The biometric identifier is then stored for future use in authenticating the person.

Individualizing of the captured signal is accomplished using the method of the present invention. The process of individualizing the signal typically comprises capturing and recording a number of signals, estimating particular univariate and multivariate features of the signals, individualizing the measurements of the features, and calculating probabilities for measurements of the feature. More specifically, one embodiment of the present invention comprises the steps of recording and saving the signal, measuring particular features of the signal, calculating the average of each measured feature, subtracting each measurement from the average to yield a centroid value, then, dividing each centroid by the standard deviation as calculated using the individualization set, determining the probability of the resulting figure using a distribution calculation, and comparing the probability to the minimum value established.

Correlations between features are also calculated and compared to a threshold value. Correlation values above a specified threshold then qualify the multivariate characteristic for inclusion in authentication. The multivariate parameters of centroid, standard deviation and covariance are used to calculate the multivariate probability for comparison to the minimum value established.

Detailed Discussion of the Prior Art References in Light of the Present Invention

The prior art references are listed above and discussed in reverse chronological order.

United States Patent No. 6,289,453 issued on September 11, 2001, to Walker et al (hereinafter "Walker") discloses methods and apparatuses for acquiring a physical measurement, and for creating a cryptographic certification of that measurement, such that its value and time can be verified by a party that was not necessarily present at the measurement. The certified measurement may also include corroborative information for associating the actual physical measurement process with the certified measurement. Such corroborative information may reflect the internal or external state of the measurement certification device, as well as witness identifiers of any persons that may have been present at the measurement acquisition and certification. The certification may include a signal receiver to receive timing signals from a satellite or other external source. The external timing signals may be used to generate the time included in the certified measurement, or could be used to determine the location of the measurement certification device for inclusion in the certified measurement.

The present invention is readily distinguishable from the teachings of Walker. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Walker. Walker discloses methods and apparatuses for acquiring and certifying physical measurements relating to the environment, such as the weather, earthquakes, and the like. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker. As such, Walker clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Walker neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 6,275,806 to Pertrushin

United States Patent No. 6,275,806 issued on August 14, 2001, to Pertrushin (hereinafter “Pertrushin”) relates to a database that includes statistics of human associations of human voice parameters with emotions. A voice signal is received. At least one feature of this voice signal is extracted. This extracted voice feature is then compared to the voice parameters in the database. An emotion is selected from the database based on the comparison of the extracted voice feature to the voice parameters. Input from the user is received. This input includes a user-determined emotion. The user-determined emotion is compared with the emotion selected from the database. The selected emotion is output and a determination as to whether the user-determined emotion matches the emotion selected from the database is made. A prize is then awarded to the user if the user-determined emotion is determined to match the selected emotion from the database.

The present invention is readily distinguishable from the teachings of Pertrushin. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Pertrushin. Pertrushin relates to a system, method and article of manufacture for detecting emotion in voice signals by utilizing statistics for voice signal parameters. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker. The biometric marker does not require the analysis of volitional acts, as required with voice analysis. As such, Pertrushin clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Pertrushin neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 6,269,348 issued on July 31, 2001, to Pare, Jr. et al (hereinafter "Pare") discloses a method and device for tokenless authorization of an electronic payment between a payor and a payee using an electronic third party identicator and at least one payor bid biometric sample. The method comprises a payor registration step, wherein the payor registers with an electronic third party identicator at least one registration biometric sample, and at least one payor credit/debit account. The payee registers a payee identification data with the electronic third party identicator. An electronic financial transaction is formed between the payor and the payee, comprising payee bid identification data, a transaction amount, and at least one payor bid biometric sample, wherein the bid biometric sample is obtained from the payor's person, in a transaction formation step. The payee bid identification data, the transaction amount, and payor bid biometric sample are electronically forwarded to the third party electronic identicator. A comparator engine compares the bid biometric sample with at least one registered biometric sample for producing either a successful or failed identification of the payor. The comparator engine also compares the payee's bid identification data with a payee's registered identification data for producing either a successful or failed identification of the payee. Once the device successfully identifies the payor and payee, a biometric-based authorization of an electronic payment is issued without the payor presenting any personalized man-made tokens such as magnetic swipe cards or smartcards to transfer funds from the payor's financial credit/debit account to the payee's financial account.

The present invention is readily distinguishable from the teachings of Pare. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Pare. Pare relates to obtaining biometric input through the use of a finger image sensor or an iris scan. In

contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker. The biometric marker does not require the scanning or mapping of anatomical structure. As such, Pare clearly does not anticipate nor render obvious independent claims 1, 2 and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Pare neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 6,232,874 to Murphy

United States Patent No. 6,232,874 issued on May 15, 2001, to Murphy (hereinafter "Murphy") discloses a system for restricting use of a vehicle by a selected vehicle operator to permitted time intervals and permitted vehicle travel corridors. If a driver is seated behind the driver's wheel, the system requires that the driver provide one or more samples of an ident indicium, such as a fingerprint, facial scan, retinal scan, voice sample or blood sample analysis, to identify the driver, or of a personal identification indicium contained on a token or card, or of personal information entered using a data entry device (e.g., keypad). When this indicium is satisfactorily presented and analyzed, the system allows operation of the vehicle (including selected vehicle accessories) but further determines (i) whether the present time and/or accumulated vehicle operation time and/or mileage is within a permitted time interval or accumulated time and/or mileage range and (ii) whether the vehicle present location and/or speed are within permitted ranges corresponding to the permitted time interval. If either condition (i) or (ii) is not met, vehicle operation is temporarily disabled, or a coded alarm signal is transmitted, or other appropriate control actions are taken. Alternatively, operation of a vehicle is restricted to one or more permitted location and/or velocity ranges and to one or more permitted time intervals or accumulated operation time and/or mileage

ranges. Vehicle location determination (LD) can be implemented using signals from GPS, GLONASS, LEO, LORAN or similar LD systems. A permitted travel region and/or a permitted time interval can be changed remotely, by transmission of a change or reprogramming signal, or can be changed at the LD system carried on the vehicle.

The present invention is readily distinguishable from the teachings of Murphy. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Murphy. Murphy relates to imposition or restrictions on or control of use, or inappropriate use, of a vehicle by a vehicle operator, in a manner that minimizes the possibility of evasion by a restricted operator. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker. As such, Murphy clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Murphy neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 6,225,890 to Murphy

United States Patent No. 6,225,890 issued on May 1, 2001, to Murphy (hereinafter "Murphy") discloses a system for restricting use of a vehicle by a selected vehicle operator to permitted time intervals and permitted vehicle travel corridors. If a driver is seated behind the driver's wheel, the system requires that the driver provide one or more samples of an ident indicium, such as a fingerprint, facial scan, retinal scan, voice sample or blood sample analysis, to identify the driver, or of a personal identification indicium contained on a token or card, or of personal information entered using a data entry device (e.g., keypad). When this indicium is satisfactorily presented and analyzed, the system allows operation of the vehicle (including selected vehicle

accessories) but further determines (i) whether the present time and/or accumulated vehicle operation time and/or mileage is within a permitted time interval or accumulated time and/or mileage range and (ii) whether the vehicle present location and/or speed are within permitted ranges corresponding to the permitted time interval. If either condition (i) or (ii) is not met, vehicle operation is temporarily disabled, or a coded alarm signal is transmitted, or other appropriate control actions are taken. Alternatively, operation of a vehicle is restricted to one or more permitted location and/or velocity ranges and to one or more permitted time intervals or accumulated operation time and/or mileage ranges. Vehicle location determination (LD) can be implemented using signals from GPS, GLONASS, LEO, LORAN or similar LD systems. A permitted travel region and/or a permitted time interval can be changed remotely, by transmission of a change or reprogramming signal, or can be changed at the LD system carried on the vehicle.

The present invention is readily distinguishable from the teachings of Murphy. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Murphy. Murphy relates to imposition or restrictions on or control of use, or inappropriate use, of a vehicle by a vehicle operator, in a manner that minimizes the possibility of evasion by a restricted operator. In contrast, the independent claims of the present invention relate to individualizing a heartbeat of an individual for use as a biometric marker. As such, Murphy clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Murphy neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 6,208,264 to Bradney et al.

United States Patent No. 6,208,264 issued on March 27, 2001, to Bradney et al (hereinafter "Bradney") discloses a financial transaction customer that carries a card key containing a unique, machine-readable code. The code is an encrypted data set representing the user's thumbprint. A scanning system senses the user's thumbprint on or adjacent the card key as he turns the card key in a keyhole. The code and thumbprint are read by laser and must match previously recorded data before an indication of satisfactory identification can be returned. The identification system further includes a centralized database containing data and processing software for recognizing the encoded card keys of the system, in addition to data and processing software for authenticating a user's thumbprint. A network links this centralized database to a number of remote terminals at sites where identification is required. Such a distributed network is common in today's identification systems involving more than one remote site.

The present invention is readily distinguishable from the teachings of Bradney. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Bradney. Bradney relates to authenticating a user's thumb print. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require the scanning or mapping of anatomical structure. As such, Bradney clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Bradney neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 6,202,151 to Musgrave et al.

United States Patent No. 6,202,151 issued on March 13, 2001, to Musgrave et al (hereinafter "Musgrave") discloses a technique for combining biometric identification with digital certificates for electronic authentication called biometric certificates. The technique includes the management of biometric certificates through the use of a biometric certificate management system. Biometric certificates may be used in any electronic transaction requiring authentication of the participants. Biometric data is pre-stored in a biometric database of the biometric certificate management system by receiving data corresponding to physical characteristics of registered users through a biometric input device. Subsequent transactions to be conducted over a network have biometric certificates generated from the physical characteristics of a current user, which is then appended to the transaction, and which then authenticates the user by comparison against the pre-stored biometric data of the physical characteristics of users in the biometric database.

The present invention is readily distinguishable from the teachings of Musgrave. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Musgrave. Musgrave relates to the use of a biometric input device that generates first biometric data from the physical characteristics of the user, such as fingerprints, hand geometry, iris appearance, retinal appearance, audio characteristics of a user, or facial appearances. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. Neither does it require the analysis of volitional acts, such as are required with voice or signature analysis. As such, Musgrave clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the

independent claims, Musgrave neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 6,193,153 to Lambert

United States Patent No. 6,193,153 issued on February 27, 2001, to Lambert (hereinafter "Lambert") discloses a computer peripheral device for providing a computer system with user input data and user biometric data includes an event sensing portion for detecting a user action and for converting the user input into a data first stream, the user action of a type appropriate for the computer peripheral device, a biometric acquisition portion for acquiring biometric data from the user at substantially a same time the event sensing portion detects the user action, and for converting the biometric data into a second data stream, and a processor coupled to the event sensing portion and the biometric acquisition portion for reversibly encoding the first data stream and the second data stream to form a third data stream, and for providing the third data stream to a computer system or a network.

The present invention is readily distinguishable from the teachings of Lambert. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Lambert. Lambert relates to the use of a biometric scanning device. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning anatomical structure. As such, Lambert clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Lambert neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 6,182,892 to Angelo et al.

United States Patent No. 6,182,892 issued on February 6, 2001, to Angelo et al (hereinafter "Angelo") discloses a fingerprint authentication methodology in which a smart card with a credit card form factor is used to transmit the imprint of a fingerprint to a live-scan device. Use of a credit card form avoids direct contact of the imprint with the live-scan device, reducing wear and tear on the live-scan device. Use of a "smart" card to store an imprint template enables the owner of user to maintain control of the print.

The present invention is readily distinguishable from the teachings of Angelo. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Angelo. Angelo relates to the transmission of an imprint of a fingerprint to a live-scan device. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. As such, Angelo clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Angelo neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 6,171,112 to Clark et al.

United States Patent No. 6,171,112 issued on January 9, 2001, to Clark et al. (hereinafter "Clark") discloses a method and apparatus for recorded information conveyance and comprehension are provided that include a Virtual Interactive Teaching and Learning (VITAL) Center. The VITAL Center provides an interactive patient education and informed consent process that increases patient comprehension using presentations that offer a baseline education about medical and surgical

procedures including the associated risks, benefits and alternatives. The patient's comprehension of the material is confirmed throughout the presentation using summary questions focused on key information. The patient is able to record their own questions or concerns about the procedure while watching the presentation. After the presentation is finished, A healthcare professional reviews the patient questions upon completion of the presentation, and any information the patient did not understand is further explained at this time. After all questions and concerns are addressed and the patient has a comfortable understanding of the procedure, the patient signs an informed consent electronically. Using digital video capture, the VITAL Center simultaneously records the information presented, the patient viewing the interactive presentation, the patient-physician interaction, and the informed consent process. The entire recorded education session and informed consent is stored permanently on optical disk media.

The present invention is readily distinguishable from the teachings of Clark. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Clark. Clark relates to the use of fingerprints and retinal scans. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. Neither does it require the analysis of volitional acts, such as are required with voice or signature analysis. As such, Clark clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Clark neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 6,164,403 to Wuidart

United States Patent No. 6,164,403 issued on Wuidart (hereinafter "Wuidart") discloses a security system of the type having a fixed terminal and a portable unit such as a remote control. The portable unit produces an activation signal based on active intervention by a user and a measurement signal based on the measurement of a biometrical signature of the user. A control signal is generated when the activation and measurement signals are both generated within a specified temporal window and the measured biometrical signature corresponds to that of an authorized user. Thus, there is a reduced chance of both the security system being disarmed by an ill-intentioned third party and of untimely or inadvertently disarming the system.

The present invention is readily distinguishable from the teachings of Wuidart. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Wuidart. Wuidart relates to the use of voice recognition or a fingerprint. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. Neither does it require the analysis of volitional acts, such as are required with voice or signature analysis. As such, Wuidart clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Wuidart neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 6,148,094 to Kinsella

United States Patent No. 6,148,094 issued on November 14, 2000, to Kinsella (hereinafter "Kinsella") discloses a pointing device that incorporates a biometric sensor at a location such that

when operating the pointing device in a normal manner, a user's hand rests naturally in a position to place a finger of the user's hand in proximity to and readable by the biometric sensor. In one embodiment, a computer trackball pointing device includes a fingerprint sensor which is equally well suitable for use by either a right-handed or a left-handed user. Along with positional information from a position sensor and user selection information from at least one user-depressable button, the pointing device also conveys to an attached computer system information associated with the user's identity detected by the fingerprint sensor. Such a pointing device is well suited to both transparent verification as well as continuous verification, for if a user removes his or her hand from the natural position when using the device, the user's fingerprint will no longer be detectable by the fingerprint sensor, and the computer system to which the pointing device is attached can be alerted as to the need to re-authenticate any additional attempts at using the pointing device.

The present invention is readily distinguishable from the teachings of Kinsella. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Kinsella. Kinsella relates to the detection of a user's fingerprint. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. Neither does it require the analysis of volitional acts, such as are required with voice or signature analysis. As such, Kinsella clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Kinsella neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 6,104,922 to Baumann

United States Patent No. 6,104,922 issued on August 15, 2000, to Baumann (hereinafter "Baumann") discloses a method and apparatus for authenticating subscriber units and users in a communications system that includes a communications node which receives biometric information describing a user, and measures an RF signature of the subscriber unit. The biometric information and RF signature are compared against a valid user profile to determine authenticity of the user and the subscriber unit. The biometric information can include retinal scan data, fingerprint data, or other data. The RF signature can include spectral content, phase or frequency characteristics, or other identifying features.

The present invention is readily distinguishable from the teachings of Baumann. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Baumann. Baumann relates to the use of retinal scan data or fingerprint data. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. Neither does it require the analysis of volitional acts, such as are required with voice or signature analysis. As such, Baumann clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to independent claim 1, Baumann neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 6,104,913 to McAllister

United States Patent No. 6,104,913 issued on August 15, 2000, to McAllister (hereinafter "McAllister") discloses a personal area network (PAN) device that enables the communication of

data using galvanic properties of the skin. A person can wear a processor coupled to a PAN device. When the person touches a sensor capable of communicating with the PAN, the processor sends and receive data through the PAN and the sensor. In accord with the invention, the processor stores personal information related to the wearer's telephone service, such as the person's identification and billing information. The processor also may store information relating to the person's telephone subscriber profile, defining that person's individualized telephone services. When the wearer touches a sensor on a pay telephone, the processor supplies the data through the PAN and the sensor to a processor in the telephone. The telephone communicates the data through the telephone network, to enable the network to provide personalized services. For example, the network uses the billing information to bill any calls that the person makes to the person's normal telephone account, in a manner analogous to a credit card type billing procedure. A feature of the invention is that virtually positive identification of a person is implemented preferably using biometric characteristics of the actual caller.

The present invention is readily distinguishable from the teachings of McAllister. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of McAllister. McAllister relates to the use of voice authentication. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. Neither does it require the analysis of volitional acts, such as are required with voice or signature analysis. As such, McAllister clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the

independent claims, McAllister neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 5,987,232 to Tabuki

United States Patent No. 5,987,232 issued on November 16, 1999, to Tabuki (hereinafter "Tabuki") discloses an authentication of users on networks that is performed more easily and efficiently, as follows: Authentication data sent from the application client 20 is relayed to a verification server 30 by the application server 10. The verification server 30 maintains a database of valid authentication data, against which it verifies received authentication data. Verification results are sent to the application server 10, which then processes users on the basis of these results. As a result, the configuration of application servers 10 is simplified. Verification servers or servers 30 can be used by a plurality of application servers 10, allowing for the efficient use of resources on a network.

The present invention is readily distinguishable from the teachings of Tabuki. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Tabuki. Tabuki relates to the use of a user's signature that is input on a tablet. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require the analysis of volitional acts, such as are required with voice or signature analysis. As such, Tabuki clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Tabuki neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 5,774,571 to Marshall

United States Patent No. 5,774,571 issued on June 30, 1998, to Marshall (hereinafter “Marshall”) discloses a verification apparatus comprising a writing instrument having a body and a grip sensor for sensing grip pressure patterns of a person when the person is holding the writing instrument and executing an intended movement, the verification apparatus being such that the sensed grip pressure patterns are able to be compared with stored grip pressure patterns values for the person in order to obtain information about the person executing the movement with the writing instrument. The verification apparatus may include a writing pressure sensor, an angle pressure sensor and a gyroscope.

The present invention is readily distinguishable from the teachings of Marshall. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Marshall. Marshall relates to signature verification and graphological character profiles. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require the analysis of volitional acts, such as are required with signature analysis. As such, Marshall clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Marshall neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 5,737,439 to Lapsley et al.

United States Patent No. 5,737,439 issued on April 7, 1998, to Lapsley et al (hereinafter “Lapsley”) discloses an anti-fraud biometric scanner that determines whether an object exhibits characteristics of blood flow consistent with that of a live human. The anti-fraud biometric scanner

has biometric scanning means for obtaining a biometric sample from the object, blood flow detection means for determining whether the object exhibits characteristics of blood flow consistent with that of a live human, and deception detection means for determining if the object is attempting to deceive the blood flow detection means. The blood flow detection means comprises a first light source for illuminating the object, a photodetector for measuring light energy from the object, and computing means for controlling the first light source and processing output from the photodetector. The deception detection means provides means for detecting movement by the object in an attempt to deceptively simulate blood flow. The means for detecting movement uses the computing means and turns off the first light source, turns on a second light source, measures any time-varying light energy from the object, and, if the measured time-varying light energy is above a threshold, determines that fraud is occurring.

The present invention is readily distinguishable from the teachings of Lampsley. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Lampsley. Lampsley relates to the use of a biometric scanning means. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. As such, Lampsley clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Lampsley neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 5,719,950 to Osten et al.

United States Patent No. 5,719,950 issued on February 17, 1998, to Osten et al (hereinafter "Osten") discloses a personal, biometric authentication system. The system can be used for controlling access to equipment or physical facilities. The system employs the combination of a unique, inherently specific biometric parameter recognized and compared with stored data and at least one non-specific biometric parameter of a physiological characteristic recognized and compared with physiological norms. Positive comparison results in authentication of an individual that is not incapacitated, dismembered, or deceased.

The present invention is readily distinguishable from the teachings of Osten. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Osten. Osten relates to the use of fingerprints, palm prints, pore prints, voice prints, handwriting, and retinal configurations. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. Neither does it require the analysis of volitional acts, such as are required with voice or signature analysis. As such, Osten clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Osten neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 5,666,400 to McAllister et al.

United States Patent No. 5,666,400 issued on September 9, 1997, to McAllister et al (hereinafter "McAllister") discloses, in a switching system for connecting a call between a calling station and a called station, a system and method of voice recognition using a concentrated or

distributed multiplicity of voice recognition and other resources with a facility for selecting an initial resource on the calling station going off-hook by accessing a demographic database and a biometric database using common channel signaling and selecting a prompt to be delivered to the caller from a multiplicity of preselected prompts and reacting to a response by the caller with further addressing of database information to continue to select from said multiplicity of resources the most appropriate resource or resources in reaction to caller utterances. According to another feature the selection of resources is aided by optical means at the calling station delivering information regarding characteristics of the caller including lip movement to permit lip reading.

The present invention is readily distinguishable from the teachings of McAllister. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of McAllister. McAllister relates to voice recognition and lip reading. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. Neither does it require the analysis of volitional acts, such as are required with voice analysis. As such, McAllister clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, McAllister neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 5,623,552 to Lane

United States Patent No. 5,623,552 issued on April 22, 1997, to Lane (hereinafter "Lane") discloses a self-authenticating identification card that includes a fingerprint sensor for authenticating the identity of a user. An ID card memory permanently stores information related to a fingerprint of

the card user. An on-card authenticator compares information related to a sensed fingerprint with the stored fingerprint information and produces an authentication signal if the sensed fingerprint information matches the stored fingerprint information. An audio generator is preferably included in the card for transmitting a predetermined audio signal to a speaker if a match is sensed. A second memory, in the form of a programmable magnetic stripe, may be included on the card for storing account information related to the card user. A magnetic stripe programmer is then used for loading predetermined account information into the programmable magnetic stripe if the sensed fingerprint information matches the stored fingerprint information. Account information is automatically cleared from the programmable magnetic stripe after a predetermined elapsed time.

The present invention is readily distinguishable from the teachings of Lane. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Lane. Lane relates to the use of a fingerprint sensor. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. As such, Lane clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Lane neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 5,335,288 to Faulkner

United States Patent No. 5,335,288 issued on August 2, 1994, to Faulkner (hereinafter "Faulkner") discloses a biometric measuring apparatus for recognizing a person's identity based on measurements performed on the person's hand. An arrangement for producing and storing a silhouette image of at least a portion of a person's hand is combined with an arrangement for

producing and storing a structured light image of the same portion of a person's hand. An analyzing device analyzes the stored images to produce hand feature data. The silhouette image provides finger silhouette feature data and the structured light image provides finger height characteristic data. The apparatus stores hand feature data obtained during a hand enrollment operation cycle to compare with hand feature data produced in a subsequent hand bid operation cycle to determine if the person has previously been enrolled on the apparatus.

The present invention is readily distinguishable from the teachings of Faulkner. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Faulkner. Faulkner relates to scanning hand geometry. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. Neither does it require the analysis of volitional acts, such as are required with voice or signature analysis. As such, Faulkner clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Faulkner neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 5,230,025 to Fishbine et al.

United States Patent No. 5,230,025 issued on June 20, 1993, to Fishbine et al (hereinafter "Fishbine") discloses a system for generating data characteristic of a rolled skinprint in real time. A body part such as a finger contacts a receiving surface of an optical device. The receiving surface is imaged and recorded on an image recording medium during the period of contact. The resulting

record is then used to generate digital data representative of the image of the skinprint. This is especially useful for recording a rolled fingerprint image taken on a flat receiving surface.

The present invention is readily distinguishable from the teachings of Fishbine. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Fishbine. Fishbine relates skinprints and fingerprints. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. Neither does it require the analysis of volitional acts, such as are required with voice or signature analysis. As such, Fishbine clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Fishbine neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 5,103,486 to Grippi

United States Patent No. 5,103,486 issued on April 7, 1992, to Grippi (hereinafter "Grippi") discloses signature verification systems utilizing a hand held writing implement used to combine a user's fingerprint pattern and their hand written signature. A prism detector is scanned by a laser diode and the resultant image is optically transmitted onto either a writing surface specifically designed to receive this image or directly intergrated with use of an optical ballpoint into the applied ink simultaneous to inscription on the writing surface. Detection array converts this optical image into signals appropriate for data interface and processing for use in on line verification systems which can be used at point of signature locations where a user may seek positive identification.

The present invention is readily distinguishable from the teachings of Grippi. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Grippi. Grippi relates to the use of a biometric input device that generates first biometric data from the physical characteristics of the user, such as fingerprints, hand geometry, iris appearance, retinal appearance, audio characteristics of a user, or facial appearances. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. Neither does it require the analysis of volitional acts, such as are required with voice or signature analysis. As such, Grippi clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Grippi neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 5,088,817 to Igaki et al.

United States Patent No. 5,088,817 issued on February 18, 1992, to Igaki et al (hereinafter "Igaki") discloses an apparatus for detecting and identifying a biological object. A transparent plate has a first surface onto which a light beam is projected and a second surface onto which a biological object to be detected and identified is placed. The light beam projected toward the first plate surface is transmitted through the plate and toward the object on the second surface, from which the light beam is reflected and retransmitted through the plate toward and through the first surface thereof and received and detected by an optical detector. The detection of a biological object is confirmed by comparing the change of the wavelength characteristics of the reflected and detected light beam in

a predetermined time sequence according to the object being first placed upon and then pressed upon the second surface of the transparent plate with respective, known such characteristics thereof.

The present invention is readily distinguishable from the teachings of Igaki. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Igaki. Igaki relates to the identification of a fingerprint. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. Igaki clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Igaki neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 5,077,803 to Kato et al.

United States Patent No. 5,077,803 issued on December 31, 1991, to Kato et al (hereinafter "Kato") discloses a biological detecting system comprising a light source; a condensing optical system for condensing a light beam from the light source and irradiating the surface of a sample to be detected with a spot of light, an imaging optical system for condensing light reflected or scattered by an irradiated portion of the sample and forming an image of the irradiated portion at a predetermined location, and a photodetector arranged at the predetermined location to detect the size of the image of the irradiated portion and output a detection signal indicating the detected size of the image.

The present invention is readily distinguishable from the teachings of Kato. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Kato. Kato relates to fingerprint detection. In contrast, the independent claims of the present invention relate

to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. As such, Kato clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Kato neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 5,073,950 to Colbert et al.

United States Patent No. 5,073,950 issued on December 17, 1991, to Colbert et al (hereinafter "Colbert") discloses a method of and apparatus for verifying the identity of an individual is based on the profile of a hand print. A set of reference data is created by determining the location of the edges of each finger separately to generate a set of finger profiles, establishing a central axis for each finger profile by reference to the edges thereof, rotating the central axis of each finger profile until it is normal to a reference line, determining the width of each finger profile at predetermined locations parallel to said reference line, and recording said finger profile information. Thereafter, a candidate's finger profile can then be compared with the reference profile by comparing the width of each finger profile at predetermined locations, determining whether the corresponding between finger widths at said predetermined locations meets a predetermined criteria, and then indicating acceptance or rejection of the candidate. The apparatus does not require posts or grooves to force the hand or fingers into any predetermined position.

The present invention is readily distinguishable from the teachings of Colbert. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Colbert. Colbert relates to fingerprints and hand geometry. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a

biometric marker that does not require scanning or mapping of anatomical structure. As such, Colbert clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Colbert neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 4,784,484 to Jensen

United States Patent No. 4,784,484, issued on November 15, 1988, to Jensen (hereinafter "Jensen") discloses an apparatus for automatic scanning of a fingerprint by optical scanning of the fingerprint side of a finger comprises a scanning surface with a measuring means for the rate of movement of the finger in relation to the scanning surface, and with a scanning area, a lighting means, an optical system and an electrical/optical scanning means giving an electrical signal as a function of the fingerprint when the finger is moved in contact with the scanning surface in the direction of the arrow. The scanning is undertaken by line scanning along the scanning line in that the scanning line is imaged onto the active part of the scanning means. The active part consists for example of a number of substantially punctiform photodiodes which are coupled in the electrical circuit and receives control signals so that the photodiodes are scanned successively.

The present invention is readily distinguishable from the teachings of Jensen. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Jensen. Jensen relates to automatic scanning of fingerprints. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. Neither does it require the analysis of volitional acts, such as are required with voice or signature analysis. As

such, Jensen clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Jensen neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 4,728,186 to Eguchi et al.

United States Patent No. 4,728,186 issued on March 1, 1988, to Eguchi et al (hereinafter "Eguchi") discloses an uneven-surface data detection apparatus, includes a transparent plate having an uneven-surface contact portion against which an uneven surface to be detected is pressed. A light source illuminates the uneven-surface contact portion through the transparent plate. An uneven-surface image drawing out optical element draws out the light reflected on the uneven-surface contact portion of the transparent plate. A detector detects the light drawn out from the transparent plate by the optical element. Light reflected by a projection-facing portion of the uneven surface contact portion to be introduced into the detector diverges from a propagation direction of light reflected by a recess-facing portion of the uneven surface contact portion. The optical element is arranged to guide the light reflected by the projection-facing portion into the detector.

The present invention is readily distinguishable from the teachings of Eguchi. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Eguchi. Eguchi relates to detecting fingerprints. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. As such, Eguchi clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover,

since dependent claims 3-5, and 7 add further limitations to the independent claims, Eguchi neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 4,699,149 to Rice

United States Patent No. 4,699,149 issued on October 13, 1987, to Rice (hereinafter "Rice") discloses that the arrangement of veins is a unique characteristic of an individual. Identification is performed by means of a detector which scans a region of the skin and detects the position of subcutaneous blood vessels by measurement of a parameter such as the reflection of incident radiation. Comparison of the measured pattern with a predetermined pattern provides identification of the individual.

The present invention is readily distinguishable from the teachings of Rice. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Rice. Rice relates to a scanning device used for the identification of individuals. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. As such, Rice clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Rice neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 4,544,267 to Schiller

United States Patent No. 4,544,267 issued on October 1, 1985, to Schiller (hereinafter "Schiller") discloses a finger pressed against a platen or a fingerprint card to provide a fingerprint object that is scanned by an interrogating beam of collimated light that is linearly displaced across the platen thereby maintaining a constant angle between the interrogating light beam and the plane

of the object being scanned. As the beam scans across the fingerprint object, the reflected light beam is modulated. The modulated beam is imaged onto a linear array of photo-responsive devices to provide a series of output signals indicative of modulation information. The outputs of the devices are serially interrogated at each of successive scan positions to provide a set of signals containing fingerprint information.

The present invention is readily distinguishable from the teachings of Schiller. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Schiller. Schiller relates to fingerprints. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. As such, Schiller clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Schiller neither anticipates, nor renders obvious the dependent claims of the present invention.

United States Patent No. 4,537,484 to Fowler et al.

United States Patent No. 4,537,484 issued on August 27, 1985, to Fowler et al (hereinafter "Fowler") discloses a fingerprint imaging apparatus for use in an identity verification system or the like. The imaging apparatus includes a carriage rotatably mounted on a frame, with the carriage being driven by a stepper motor. A transparent optical element having an arcuate recess for receiving a finger to be imaged is secured to the frame. The rotatable carriage supports a light source and mirror which are positioned adjacent the optical element. The mirror is positioned with respect to the source and optical element to receive light issuing from the element which originated from the source. The light is reflected by the mirror through a lens arrangement to a second mirror and then to a linear

photo-diode array which are also mounted on the carriage. When a finger is positioned in the recess of the optical element, the motor causes the carriage to rotate so that the finger is scanned by the light source. The linear diode-array is periodically read out during the scan with the output of the array containing imaging data. The data is then processed as required to accomplish the identity verification function or the like.

The present invention is readily distinguishable from the teachings of Fowler. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Fowler. Fowler relates to fingerprint imaging. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. As such, Fowler clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Fowler neither anticipates, nor renders obvious the dependent claims of the present invention.

Japanese Patent No. JP02000181871A to Timothy

Japanese Patent No. JP02000181871A having an application date of December 9, 1999, (hereinafter "Timothy") discloses a user that inputs living body measurement data (fingerprint, etc.), through a biometric input sensor. An encryption processor assembly (EPA) enciphers a combination of biometric data and transaction data by using a key K1 and adds the ID of the EPA to a request message. The message is sent to a credit server. The server uses EPAID to retrieve the key K2 of the user associated with a data base and deciphers the message with the key K2. A confirming function retrieves user data from a biometric data base by using the biometric part of the message,

makes an authentication decision, and enciphers the replay with the key K2. The server sends the reply to the user.

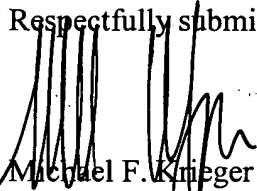
The present invention is readily distinguishable from the teachings of Timothy. This is apparent upon examination of independent claims 1, 2, and 6 of the present invention in light of Timothy. Timothy relates to fingerprints. In contrast, the independent claims of the present invention relate to individualizing a heartbeat signal of an individual for use as a biometric marker that does not require scanning or mapping of anatomical structure. Neither does it require the analysis of volitional acts, such as are required with voice or signature analysis. As such, Timothy clearly does not anticipate nor render obvious independent claims 1, 2, and 6 of the present invention. Moreover, since dependent claims 3-5, and 7 add further limitations to the independent claims, Timothy neither anticipates, nor renders obvious the dependent claims of the present invention.

Summary and Conclusion

In light of the foregoing, Applicants respectfully submit that the claims of the present invention contain limitations that are neither disclosed nor rendered obvious by the relevant references discovered in the pre-examination search. The unique combination of features or elements presented in the present invention are not found in any of the prior art references. Applicants therefore respectfully submit that the present invention is patentable over the prior art references.

DATED this 13 day of February, 2002.

Respectfully submitted,


Michael F. Krieger
Attorney for Applicant
Registration No. 35,232

KIRTON & McCONKIE
1800 Eagle Gate Tower
60 East South Temple
Salt Lake City, UT 84111
Telephone: (801) 328-3600
Facsimile: (801) 321-4893

DBT:je
604971.1